Trajectories of Team and Individual Sports Participation in Childhood and Links with

Internalizing Problems

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Abstract

The purpose of this 5-year longitudinal study is to identify trajectories of team and individual sports participation in childhood, and to compare these trajectories on different types of internalizing problems. Parents reported their children's annual sports participation from the ages of 6 to 10 ($n = 785$) and teachers reported internalizing problems (depression, anxiety, social withdrawal) at the beginning and at the end of this period. The study used latent class growth analyses to identify two trajectories of team sports and two trajectories of individual sports participation were identified: 1) high participation, and 2) low participation. Considering baseline level of internalizing problems and gender, children in the high participation team sports trajectory show significantly fewer depression, anxiety, and social withdrawal behaviors at age 10 than those in the low participation team sports trajectory. No differences between individual sports trajectories were observed. Comparison with joint trajectory groups partially confirmed these results but also showed that sustained participation in multiple individual sports could also be linked to decreased anxiety. Our findings suggest that participation in team sports should be encouraged to promote certain aspects of children's mental health.

Keywords: sport, physical activity, anxiety, depression, social withdrawal

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Participation in sports and other forms of physical activity has the potential to protect children and adolescents from mental health issues (Eime et al., 2013). Specifically, for internalizing type problems, participation in such activities has been linked to decreases in symptoms of depression (McKercher et al., 2012), anxiety (Findlay & Coplan, 2008), and social withdrawal (Schumacher Dimech & Seiler, 2011). However, few studies have investigated the associations between different types of sports and children's internalizing problems over the course of the elementary school years. Doing so would further our understanding of how sports are related to mental health in such an important developmental period (Aronen & Soininen, 2000). According to some authors, a distinction between team and individual sports can be made. Team sports, possibly due to the social nature of the activity, would be associated with lower levels of internalizing problems than individual sports (Eime et al., 2013; Moeijes et al., 2019). Looking at the differential associations between team and individual sports could inform public health policies about the type of sports that they should highlight to promote positive mental health in childhood. This study aimed to verify the associations team versus individual sports participation trajectories assessed between the ages of 6 to 10 and subsequent children's internalizing problems at age 10.

Link Between Organized Sports and Internalizing Problems

Children generally express internalizing problems as sadness, fear, loneliness, peer problems, loss of interest or psychosomatic problems. More specifically, these manifestations are usually grouped into symptoms of depression, anxiety and, more broadly, social withdrawal (Eisenberg et al., 2001). Around 25% of children present a high level of internalizing problems before age 10 (Riberdy et al., 2013). Since these difficulties can lead to

some significant issues in adolescence and adulthood, it is important to address them early in development (Clayborne et al., 2019; Essau et al., 2014).

Organized sports are often proposed among the resources to help reduce or prevent these problems (McKercher et al., 2012; Vella et al., 2015). For example, the conceptual model of health through sport proposed by Eime et al. (2013) suggests that children's mental health is enhanced by the ecological aspects of organized sports (e.g., social relationships with teammates and coaches), the dimensions of context (e.g., organized or informal) and the interaction between the types of health outcome improved by sports (e.g., physical and psychological). In other words, the physical aspect of organized sports gives children the opportunity to improve overall health and reduce the risk of obesity (Hills et al., 2011), whereas the social aspect of organized sports gives them the opportunity to form meaningful relationships with significant others (Denault & Poulin, 2007). These two aspects, in turn, could help children overcome their internalizing problems. However, although all sports may promote the physical aspect, the same is possibly not valid for the social aspect. Indeed, this might be an important distinction between team and individual sports.

Team versus Individual Sports and Internalizing problems

Individual sports are a form of sport where children compete alone against other participants, considered as opponents, in an effort to achieve a personal goal (Moeijes et al., 2018). On the other hand, team sports are sports where children compete cooperatively as a group to achieve a shared goal against another group of children also considered as opponents (Moeijes et al., 2018; Sabiston et al., 2016). Consequently, the social experiences in these two types of sports are likely to be different. First, the friendships formed in these sports may differ. Indeed, a study reveals that friendships between co-participants in team sports are more oriented toward peer support compared to friendships with co-participants in individual sports (Poulin & Denault, 2013). Second, it is possible that team sports offer a greater sense of peer

group belonging than individual sports due to the cooperative nature of the activity. According to Graupensperger et al. (2020), being part of a sports team represents an important opportunity for social identification, which may increase personal well-being. Notably, sports teams have several rituals that may enhance this sense of belonging and identification, such as a team jersey, a team name and rallying cries. In contrast, participants in individual sports sometimes compete against members of their same affiliation, which may influence their sense of belonging. Third, the degree of task interdependence is undoubtedly different in these two types of sports. While performance in individual sports depends solely on the participant, team sports require the contribution of all to achieve an optimal outcome (Hansen et al., 2010). This could result in more internal attributions following a poor performance in individual sports compared to team sports (Nixdorf et al., 2016). Even though individual sports are often practiced in a group setting, they feature less collaborative work, group goal achieving, and positive interactions with peers who would not normally be part of the social network (Hansen et al., 2010).

Considering the different experiences these two types of sports offer, team sports could lead to fewer internalizing problems. This assumption is supported by prior studies conducted in older children that show an association between organized sports and lower levels of internalizing problems for team sports but not for individual sports (Boone & Leadbeater, 2006; Moeijes et al., 2019; Schumacher-Dimech & Seiler, 2011). For instance, Graupensperger et al. (2021) found negative within-person prospective associations between the number of hours per week participating in team sports and anxiety and depression in adolescents. In contrast, no within-person associations were found between individual sports and anxiety and depression. In other words, the authors did not report differences when comparing youth based on their overall involvement in team or individual sports. Rather, they

reported that when an athletes increased team sport involvement, their depression and anxiety symptoms decreased over time – a pattern that was not evident for individual sports.

However, the literature has several limitations on the topic to date. First, the few studies that distinguish between team and individual sports generally measure sport participation with the number of hours spent or frequency of participation per week (e.g., Moeijes et al., 2018), and only a few use other methods such as presence or absence of participation (e.g., Vella et al., 2015). This operationalization does not adequately capture the social experiences that may differ in the two types of sports since the variation in the score on these variables essentially does not inform about the diversity in the number of different social contexts. A youth who participates in a sport at a high frequency does not necessarily meet many other peer groups in a week. A better way to capture these differences would be to measure the number of different social contexts in which the child is engaged in or, in other words, the number of different sports of a type. For example, a child participating in multiple sports is exposed to several different peer groups with many opportunities for forming friendships and a sense of group belonging, and several opportunities to relate to adults in charge of the activities. On the other hand, the number of hours of participation in a sport may not be an optimal indicator of the social experiences within sports, as this method does not consider the different groups to which the child may belong. Second, few studies have considered young children, which seems crucial considering that this is an important developmental period where social competencies are being developed, and healthy lifestyle habits are often established (Baker et al., 2019). Third, few have simultaneously examined several types of internalizing problems, preventing a more detailed picture of these associations. Fourth and most importantly, not all studies adopt a longitudinal design, which limits the possibility of drawing conclusions about the direction of the associations. For example, it is also possible that internalizing problems make children less inclined to

participate in sports, as has been observed in adolescents (Brière et al., 2018). Moreover, when studies adopt a longitudinal design, it rarely includes more than two time points, preventing verification of whether children participate on an on-off or on a sustained basis over time.

The Importance of Looking at Trajectories of Team and Individual Sport Participation

Sustained participation over time is an important dimension of organized sports participation. In general, children who participate in sports on a sustained basis report fewer mental health problems than those who drop out (Findlay et al., 2009; Vella et al., 2015). This is likely explained by the exposure to the beneficial effects of sports over a longer period. Thus, differentiating between children who participate on a sustained basis and those who do not is important. One way to do so is to look at trajectories of participation in organized sports. One of the advantages of this method is that it allows for heterogeneity in the evolution of sports participation by creating subgroups of individuals who are similar in their participation over time, rather than simply examining the mean participation of the sample (Howie et al., 2016). In addition, given that opportunities to participate in organized sports are limited during early childhood but increase with age (Fletcher et al., 2003) and that sports participation may evolve differently from one child to another, this statistical person-centered approach is particularly suited to detect individual differences over time and to provide a more accurate picture of the effect of sustained sports participation.

To our knowledge, only one study specifically looked at trajectories of sports participation among a sample of elementary-school children. In their study, Brière et al. (2019) measured participation in organized physical activities between ages 6 to 10 among a sample of 2837 children. Using latent class analyses, they found two trajectories based on the probability that they will do at least one physical activity: one consistent participation (61% of children) and one low-inconsistent participation (39% of children). After controlling for

baseline levels of internalizing problems, their results revealed that children in the consistent participation trajectory reported fewer symptoms of depression, anxiety, and social withdrawal than those in the low-inconsistent participation trajectory. Although this study clearly demonstrates the importance of sustained participation for decreasing internalizing problems among children, all types of organized sports were considered together. Yet, as argued earlier, it is important to distinguish between team and individual sports if we want to better understand the relationships between sports participation and internalizing problems.

The Current Study

The first objective of this study was to identify trajectories of participation in both team and individual sports between ages 6 to 10. Therefore, the number of different team sports and the number of different individual sports practiced was measured annually. Based on past research (e.g., Brière et al., 2019), we expected two trajectories of participation. A first trajectory would include children who participate in multiple sports each year ("high participation") and a second trajectory would consist of children who either do not participate much or at all in sports at all measurement points ("low participation"). Because this study is the first to our knowledge to separately examine the evolution of participation in two different types of sports in childhood, it is difficult to make clear hypotheses about the distinction between them. However, parents are usually decisive in the choice of organized activities practiced in childhood (Fletcher et al., 2003). Thus, as in Brière et al. (2019), it seems plausible that a high and a low trajectory will be observed, since an active parent will probably tend to involve their child in organized physical activities from years to years (Petersen et al., 2020). Finally, the trajectories should be quite stable or increase somewhat, as the frequency of participation in organized physical activities between 6 to 10 is generally stable according to studies (Findlay et al., 2009).

The second objective was to examine the associations between team sports and individual sports participation trajectories and internalizing problems at age 10. Three categories of internalizing problems were examined: depression, anxiety, and social withdrawal. Based on prior studies, for team sports, we expected that children in a high participation trajectory would have significantly lower levels of depression, anxiety, and social withdrawal problems at age 10 than those in a low participation trajectory. For individual sports, we hypothesized that no differences would be observed between the two trajectories. To control for possible selection effects (Brière et al., 2018), we included the 6 years old baseline level of internalizing problems as a covariate. We also included gender as a covariate, since boys tend to play more team sports than girls and generally seem to benefit more from sports than girls in terms of mental health (Moeijes et al., 2019; Schumacher Dimech & Seiler, 2011).

Method

Participants

Participants in this longitudinal study came from 250 kindergarten classes in 40 elementary schools in a Canadian city with a population of 500,000. Recruitment took place as part of a broader research project assessing a program's impact on preventing violence and school dropout (Poulin et al., 2013). A total of 1038 children (62% boys, M_{age} = 65.2 months, SD = 3.7) were recruited over three successive annual cohorts. Parental written consent was obtained for all these children. 72% of the sample lived in families with two biological parents, while the average gross annual household salary was CAD 60,900. The majority of participants were of Canadian origin (85.5%) and all were French speaking.

Research Design and Procedures

Sports participation was measured at five time points using parent reports: in Kindergarten (May; age 6), Grade 1 (May; age 7), Grade 2 (May; age 8), Grade 3 (May; age

9) and Grade 4 (May; age 10 Kindergarten teachers assessed internalizing problems in the Fall (October) and at the end of grade 4 (May). Teacher questionnaires were distributed and collected in the schools by research assistants. Teachers sent parent questionnaires home, and parents were asked to return them in sealed envelopes. Gift certificates were given to teachers and parents to thank them for their participation. The study was approved by the Human Research Ethics Committee at the Université du Québec à Montréal.

To be included in the analyses, participants must have taken part in at least two of the five sports participation data collections ($n = 785$). Of these 785 children, 94.7% participated in the assessment in Kindergarten, 93.4% in Grade 1, 70% in Grade 2, 66.9% in Grade 3 and 66.3% in Grade 4. Comparison analyses were conducted to determine whether the children included in the analyses ($n = 785$) differed from those excluded ($n = 253$). These analyses revealed that the children included in the analyses came from families with higher gross annual incomes ($t(915) = -6.34$; $p < .001$) and had mothers with higher education ($t(933) = -2.62$; $p < .01$) than those excluded from the analyses.

Measures

Organized sports participation

In a dedicated section of the questionnaire, parents were asked to list all organized activities in which their child was registered during the last year. For each activity, they were asked to indicate the number of adults present during the sessions and the time spent on the activity per week. To ensure validity, among all the organized activities reported by the parents, we excluded those that did not have a minimum of one adult present and those that lasted less than 30 minutes per week. The sports identified by parents were then coded into two types: individual sports (e.g., swimming) and team sports (e.g., soccer). They were coded according to the definitions of team and individual sports mentioned above. For sports that could be played either as a team or individually (e.g., tennis, dance, gymnastics), and as our

measure did not distinguish how they were mostly played, we coded them as a team sport if there was no possibility of them being practiced individually. For example, tennis, gymnastics, and dance are often practiced individually at this age but may occasionally be practiced in a team setting, whereas ice hockey, soccer, handball, or lacrosse are never played individually. In this way, there is no chance of finding an individual sport in the group of sports coded as team sports. Thus we are confident that sports being coded as team sports involve some level of social interaction and interdependence in the task (i.e., maximizing the chances that beneficial social processes are involved). By choice, the only exception is for cheerleading, as between the ages of 6 and 10, in Québec, it is extremely rare, even surprising, to see individual competitions. We, therefore, coded it as a team sport. Two variables were then calculated: 1) the number of different individual sports practiced during the year and 2) the number of different team sports practiced during the year.

Internalizing Problems at Ages 6 and 10

The teacher questionnaire was developed as part of the Longitudinal Study of Child Development in Québec (ISQ, 2001) by combining items from widely used validated instruments with good psychometric properties (Achenbach, 1991; Kendall et al., 2007; Tremblay et al., 1987). Items are provided on a 6-point Likert scale ranging from 1 = "never or not at all" to 6 = "always or completely true". Depression was measured using seven items (e.g., "child seems unhappy or sad"), and internal consistency was excellent (α = .83 at age 6 and .86 at age 10). Anxiety was measured using eight items (e.g., "in the past few months, the child has been concerned about the loss or the possibility of something happening to a parent") and internal consistency was excellent (α = .80 and .80). Social withdrawal was measured by eight items (e.g., "the child is shy with children he/she does not know") and internal consistency was excellent (α = .82 and .83). The scores for each of these scales represent the means of the items.

While some studies rely on parent-reported measures of internalizing problems, others believe that parents may sometimes bring a significant bias by projecting their own distress onto their child (Tremblay-Perreault & Hébert, 2019). Teacher measurements could therefore be more objective, as they can compare children's behaviors with each other. Furthermore, since teachers observe children in a social context, they may notice behaviors that are not observable at home (Kendall et al., 2007). This is especially true when it comes to anxiety and social withdrawal, as these behaviors are often displayed in a social context.

Data Analysis

The analyses were performed using Mplus version 7.4 (Muthén and Muthén, 1998-2015). Missing data were estimated using the Full Information Maximum Likelihood (FIML) method. This method involves identifying the value of the parameter with the highest probability of producing the sample data from the entire database (Baraldi and Enders, 2010). Thus, using this method, children who participated in only one measurement time can be included in our analyses. For statistical convenience, we included all children who participated in at least two sports data collections ($n = 785$).

To identify the trajectories of team sports participation and the trajectories of individual sports participation, the latent class growth analysis (LCGA) procedure with zero-inflated Poisson model was used. This procedure allows the identification of sub-populations of individuals within a sample who follow a similar developmental trajectory on a repeatedly measured variable based on posterior probabilities of class membership (Muthén & Muthén, 2000). The zero-inflated Poisson approach was used because a substantial proportion of children reported no sports involvement at each time point (45.6% at age 6, 40.5% at age 7, 34.4% at age 8, 30.6% at age 9, and 30.2% at age 10). Since the number of different sports is a count variable, we created a dichotomous latent variable representing the probability of belonging to the class that cannot obtain an observed count different from zero. Moreover, the

LCGA procedure provides different fit indices to determine the optimal number of latent

trajectories as well as the shape of different curves (i.e., polynomial order). Different fit

indices were considered: the Akaike and Bayesian information criterion (AIC and BIC;

Akaike, 1987; Schwarz, 1978), entropy (Celeux & Soromenho, 1996), the Vuong-Lo-

Mendell-Rubin likelihood ratio test (VLMR; Lo et al., 2001) and the class average posterior

probabilities (Nagin, 2005). The AIC and BIC closest to zero indicate the best fit of the

models when compared to each other. Entropy indicates the percentage of delineation of the

data on the plot. Although there is no threshold to determine whether a model can be retained

based on entropy, a value of 1.00 indicates perfect delineation. The VLMR compares the

model with a number of K classes to a model with K-1 classes. A *p*-value less than .05

indicates that the selected model is significantly better than if one class was removed. Finally,

average posterior probabilities of 1.00 would indicate that participants are assigned perfectly

to their respective trajectory group.

To examine the differential associations between sport participation trajectories from

ages 6 to 10 and internalizing problems at age 10, regression analyses were conducted with

Mplus. We examined whether the trajectories of team sports and the trajectories of individual

sports predicted internalizing problems in a single model, including the three indicators of

internalizing problems. As they were highly correlated, we considered shared variance

between depression, anxiety, and social withdrawal in the structural equation model. The

FIML method of missing data estimation was also used in these analyses. Several fit indices

were considered to examine the model fit: the root mean square error of approximation

(RMSEA: ≤ .06 represent good fit; Browne and Cudeck, 1992), the comparative fit index and

the Tucker-Lewis index (CFI/TLI ≥ .95 represent good fit; Hu & Bentler, 1999). Furthermore,

we included gender and baseline level of symptoms since they may be important confounding

variables (Moeijes et al., 2018; Moeijes et al., 2019).

Results

Descriptive Statistics

A total of 84.1% (n = 660) of children participated in at least one organized sport during the study period. The most prevalent sports and their frequency are presented in Table 1. Table 2 reports the correlations between variables and the descriptive statistics. The examination of this table shows several significant negative correlations between the number of different team sports practiced each year and the three indicators of internalizing problems, whereas this is not the case for individual sports. Moreover, the average number of different team sports practiced by children increases with age, while it remains relatively stable for individual sports. Finally, gender is correlated with team sports, suggesting that boys practice more team sports than girls.

Trajectories Identification

Table 3 reports fit indices for the one-, two- and three-trajectory models for team and individual sports. We decided to limit our analyses to a three-trajectory model for both variables because the additional trajectories were qualitatively similar. For team sports, we selected the linear two-trajectory model. The two- and three-trajectory models presented the best fit, but the entropy and the average posterior probabilities were much better for the two-trajectory model. For individual sports, the two- and three-trajectory models were also better, but we decided to keep the two trajectories model, as the entropy and average posterior probabilities were better, and the evolution of the third trajectory did not make sense from a practical point of view. In addition, to reach the best fitting shape of the plots, we adjusted the polynomial growth factor of the models until it reached statistical significance. Thus, for parsimony, the model for individual sports includes a linear and a stable trajectory (i.e., the intercept only).

The estimated means and observed value of team and individual sports latent trajectory groups are presented in Figures 1 and 2. As we anticipated, the models that best fit the data are those with high/low trajectories, as in Brière et al.'s (2019) study. For team sports, 72.7% of participants ($n = 571$) follow a low participation trajectory (intercept = -2.03, slope = 0.25, inflation slope = -0.79, all parameters are significant at $p < .001$), while 27.3% ($n = 214$) follow a high participation trajectory (intercept = 0.57, slope = 0.04, inflated slope = -0.79, all parameters are significant at $p < .01$). For individual sports, 71% of participants ($n = 557$) follow a low participation trajectory (intercept = 0.79, $p < .001$), while 29% ($n = 228$) follow a high participation trajectory (intercept = -1.22, slope = -0.11, inflated slope = -7.41, all parameters are significant at $p < .05$). The posterior probabilities are excellent, varying between .93 and .96 for all trajectories, indicating that participants are assigned to their respective trajectory.

Links Between Trajectories and Internalizing Problems

The upper part of Table 4 shows the regression results for team and individual sports. The model fits the data well, CFI/TLI = .97/.96, RMSEA = .04 (90% CI = .02, .06). The results reveal that children in the high team sports participation trajectory show less depressions, anxiety, and social withdrawal at age 10 than those in the low participation trajectory, controlling for gender, baseline level of internalizing problems at age 6 and the trajectory for the other type of sport. For individual sports, participation trajectories do not predict the level of depression, anxiety, and social withdrawal, suggesting that there is no difference between children participating in multiple individual sports and those who do not. Moreover, to confirm our results with the data from the 785 participants obtained using the FIML method, we conducted sensibility analyses using the listwise deletion method ($n = 523$). Estimating missing data did not change the results obtained. The results were the same as when testing the model without missing data.

Joint Trajectories and Internalizing Problems

To further analyze the links between types of sports and internalizing problems, and to better understand the specific effect of team sports, joint trajectory analyses were conducted a posteriori in Mplus. The objective of this step was to ensure that the results previously obtained for team sports are not the result of sustained participation in a combination of both types of sports. The trajectories of participation in team sports were therefore combined with those of individual sports to create up to four new latent groups (2 x 2), and these groups were compared on the three indicators of internalizing problems. This procedure consists of calculating the probabilities that a participant in a team sports trajectory belongs to an individual sports trajectory. From these probabilities, it is possible to estimate the proportion of children who simultaneously follow a trajectory of the first and the second models.

The group of children who belong to the low participation trajectories in both team and individual sports participation ("Low participation in both sports") includes 415 participants (52.9% of the sample). The group in the high participation trajectories in both team and individual sports participation ("High participation in both sports") includes 72 children (9.2%). The group of children who belong to the low team sports trajectory and the high individual sports trajectory ("Individual sports only") includes 153 children (19.5%). Finally, children who follow a high team sports trajectory and a low individual sports trajectory ("Team sports only") comprised 145 participants (18.5%). The average posterior probabilities for all groups ranged from .91 to .97, and entropy was .94.

The latent joint trajectory groups were then compared on internalizing problems using the same procedure as in the first series of analyses, with a few exceptions. First, we created dummy codes representing the trajectory groups to compare them with each other. We, therefore, conducted three different models of analyses by changing the reference group in each analysis (i.e., a first model with the "Team sports only" group as the reference, then with

the "Low participation in both sports" as the reference, then with "High participation in both sports" as the reference). These analyses were conducted with baseline levels of internalizing problems and gender as covariates. The results are presented in Table 4. Again, the model fit the data well, CFI/TLI = .96/.95, RMSEA = .04 (90% CI = .02, .05). Results show that children in the "Team sports only" group show significantly fewer depression, anxiety, and social withdrawal than children in the "Low participation in both sports" group. Children in the "Team sports only" trajectory group also reported significantly less social withdrawal than those in the "Individual sports only" group. In contrast, those in the "Individual sports only" group do not have fewer internalizing problems than those in the "Low participation in both sports" group, with the exception of anxiety. However, the result is very close to the .05 significance threshold so it should be considered with caution. Finally, the High participation in both sports" group shows significantly less depression and social withdrawal than the Low participation in both sports" group but does not show less anxiety. These findings suggest that the results obtained in the first series of analyses are not the consequences of sustained participation in both types of sports, but rather a specific effect of team sports, except for anxiety, which likewise appears to be related to individual sports.

Discussion

To date, numerous studies have documented the effects of organized sports participation on the mental health of children and adolescents. However, very few have demonstrated these links in a longitudinal design with multiple time points and considered the distinction between team and individual sports among a sample of early school-age children. An annual longitudinal follow-up from 6 to 10 years of age allowed us to identify trajectories of both team sports and individual sports among children. Comparisons between these trajectories revealed that sustained participation in multiple team sports was associated with a

decreased level of depression, anxiety, and social withdrawal, which was not the case for individual sports. A posteriori joint trajectory analysis partially supported these results.

Trajectories of Participation in Organized Sports

Our study is the first to our knowledge to separately examine the evolution of participation in team and individual sports. At least in terms of the diversity of sports programs, it seems that the two types of sports do not differ in this respect. Therefore, when comparing the descriptive data of participants in the two trajectories for each type of sport, it can be concluded that the method used to distinguish participant profiles was appropriate since it differentiates those who participate consistently and those who do not, as was identified in previous studies (Brière et al., 2019; Findlay et al., 2009). For instance, in the low team sports participation trajectory, 84% of children reported being involved in fewer than two team sports programs during the total study period (i.e., who participated in one team sport in two of the five-year study, or who participated in two team sports in only one year of the five-year study), and 45% reported no team sports at all during the entire study period. In comparison, the high participation trajectory includes 73% of children who reported 10 or more team sports programs during the entire study period. The subsequent comparison between these groups was therefore appropriate, as it involved comparing those who showed genuine sustained interest in these peer groups over time with those who mainly did not participate at all or had some experience without necessarily becoming involved in many groups of one type of sport.

It is important to note, however, that the measure on which the trajectory analyses are based is a measure of program diversity of the same type of sport, not a measure of sport dosage (although the two are most likely related). Thus, the two high trajectories do not represent the amount of time spent in one type of sport, but rather the number of different sports practiced each year. This distinction is important since it is likely that a youth who

specializes in one sport early on will participate in it more than a youth who reports a high diversity of sports. The purpose of our operationalization was to identify the number of different peer groups in which the youth is involved to examine whether the number of opportunities for social experiences that might decrease internalizing problems would indeed be related to internalizing problems.

Team Sports, Individual Sports, and Internalizing problems

As expected, children who participated consistently in multiple team sports show significantly lower depression, anxiety, and social withdrawal at age 10 than those who did not participate much or not at all, whereas this is not the case for individual sports. Moeijes et al. (2018) also found longitudinal associations between team sports participation and internalizing problems in older children (i.e., ages 8 to 12), but these association were based on the frequency of participation, whereas our results focus on the number of different sports in which the child is registered in. Further, they also only had two measurement points, whereas our study followed children for five consecutive years. Moreover, comparisons between the joint trajectory groups confirmed our first series of analyses but added a caveat with respect to anxiety. Those who specifically participated in multiple individual sports consistently over the study period also reported less anxiety than those who participated in few or no sports. Thus, being involved in multiple sports groups, regardless of the type of sport, could be linked to decreased anxiety. However, it is important to note that this difference was very close to not reaching the significance level. This result should therefore be considered with caution. Graupensperger et al. (2021) found that at the between-person level, the frequency of participation in individual sports was also related to less anxiety in adolescents. A plausible explanation is that our measure did not distinguish between different types of anxiety. According to Ashdown-Franks et al. (2017), the number of years playing team sports would be related to reduced panic disorder and agoraphobia, whereas individual

sports would be related to reduced social phobia. A more detailed and in-depth measurement of anxiety in childhood may shed light on this finding.

There are several possible explanations as to why team sports would be more related to a decrease in internalizing problems than individual sports. First, not feeling alone in a defeat could provide tools for youth to prevent internalizing problems, unlike individual sports where there is more internal attribution following a failure (Nixdorf et al., 2016). Second, coaches can also mentor and can help build group cohesion to defeat an opposing team (Boone & Leadbeater, 2006). Since group cohesion is vital to a team's sucess, coaches are as much in charge of developing the children's physical skills as their group dynamics. Third, some authors argue that the social nature of the team sports context could contribute to this beneficial effect on youth mental health (Eime et al., 2013). Although youth primarily practice their organized individual sports in groups as children, team sports require communication skills and support between teammates to achieve team success, aspects not found in individual sports. Finally, youth in individual sports can even compete against their own group, which may bring competition between group members in this sport context. In future studies, researchers should forthwith investigate the inherent social processes that distinguish these two types of sport.

In sum, our results suggest that sustained participation in multiple team sports might be more beneficial in reducing internalizing problems among children than individual sports. However, caution is needed in interpreting our findings. The results of the present study should not be interpreted as implying that individual sports are of little importance to children. Some studies argue that participation in individual sports does have benefits, such as improved self-regulation (Howard et al., 2018), resilience (White & Bennie, 2015), and a decreased level of social phobia symptoms (Ashdown-Franks et al., 2017). They may also be related to several important developmental experiences, such as developing a work ethic,

persevering, or managing stress (Fraser-Thomas & Côté, 2009). In contrast, it is possible that

bullying among group members is more prevalent in team sports (Vveinhardt & Fominiene,

2020). This prevalence supports the importance for researchers in the field to consider the

social context in which the sport is practiced, as this variable is likely to explain the difference

observed in team and individual sports with respect to internalizing problems. Indeed, studies

have observed differences depending on the perceived level of collectivism in individual

sports (Donkers et al., 2018; Evans et al., 2012). This suggests there is potentially more

heterogeneity in the degree of interaction or partnership among group peers in individual

sports than in team sports. Our measure of team sports implies some homogeneity in this

sense since sports coded as team had to be played only in a team context. This consideration

is important since it is possible that some individual sports that involve a high level of

collectivism may be as related to internalizing problems as team sports are. Thus, future

studies should go beyond the distinction between team and individual sports and examine in

depth the social experiences that sports might offer. This could be a key variable in explaining

these links. Finally, because we measured sport participation with the number of different

sports of the same type, some youth who specialize early and have a high frequency in the

same sport rather than being involved in multiple sports may be assigned to a low trajectory.

Thus, our results could either support that participation in one team sport may be optimal,

and/or participation in multiple sports (without being specialized in one) is ideal. It may be

relevant for further studies to distinguish between youths who specialize early from those

involved in multiple programs to determine if specializing in one team sport provides the

same benefits as participating in multiple team sports.

Limitations and Strengths

This study is not without limitations. First, the sample is somewhat socio-

demographically homogeneous. Some economically at-risk children dropped out of the study

after the first measurement time and were therefore excluded from the analyses. It would be relevant to replicate this study with a more culturally and economically diversified sample. Second, as in many longitudinal studies spread over multiple years, there was attrition from one year to the next. To overcome this problem, we used a robust missing data estimation method and ran sensibility analyses using the listwise deletion method. Third, some sports such as tennis and figure skating can be played individually or in teams. Since our measure did not allow us to differentiate between them, we considered these individual sports. It would be necessary for future studies to further question children and parents about their sports participation since some sports may have been somewhat miscoded. Finally, our results should be interpreted with caution as they are correlational in nature. Only an experimental design would suggest a causal effect.

This longitudinal study also has several strengths. First, a respectably large sample size was assessed annually during the first five years of schooling (Kindergarten to Grade 4; ages 6 to 10). These data were subjected to a person-centered analysis procedure (LCGA) that identified distinct longitudinal participation patterns. Second, controlling for the level of internalizing problems prior to the trajectories of participation was particularly important since a self-selection effect, i.e., children with fewer internalizing problems are more likely to participate in organized sports, could explain the associations observed in the previous study (Brière et al., 2018). Finally, comparisons between the joint trajectory groups supported the links identified in the first series of analyses by distinguishing those who participate in only one of the two types of sports on a sustained basis.

Conclusion and Implications for Practice

Our study suggests that sustained participation in team sports is related to fewer symptoms of depression, anxiety, and social withdrawal in elementary school children, whereas individual sports are not. Participating in a team sport could thus be considered as an

additional intervention strategy in promotion and prevention programs targeting internalizing

problems among children. These organized activities are already offered in children's

communities and schools, but it seems that only team sports should be emphasized to promote

mental health in communities or during critical periods. With the increasing prevalence of

internalizing problems in childhood (Riberdy et al., 2013), it is important to identify all

resources to help children overcome these problems.

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Table 1

Most Popular Team and Individual Sports Reported by Children and their Prevalence

Team sports	Prevalence (%)
1. Soccer	33.85
2. Kin-ball	14.14
3. Hockey	12.86
4. Baseball	7.12
5. American football	4.11
6. Basketball	1.46
Individual sports	
1. Swimming	30.93
2. Martial arts (e.g., Karate)	21.91
3. Dance	17.52
4. Ski / Snowboard	8.21
5. Gymnastics	6.57
6. Tennis	4.29

Note. The prevalence column represents the percentage of children who reported this sport at least one measurement time.

Table 2

Descriptive Statistics and Correlations between the Main Variables under Study

Variable	*M (SD)*	Correlation						
		11	12	13	14	15	16	17
Number of different team sports								
1. Age 6	0.48 (0.93)	-.07	-.08	-.08*	-.07	-.06	-.11*	-.30**
2. Age 7	0.53 (0.96)	-.08*	-.09	-.03	-.10*	-.10**	-.12**	-.28**
3. Age 8	0.72 (1.07)	-.08	-.11*	-.03	-.10*	-.09*	-.15**	-.20**
4. Age 9	0.86 (1.10)	-.11**	-.10*	-.07	-.06	-.10*	-.15**	-.25**
5. Age 10	0.93 (1.11)	-.14**	-.13**	-.09	-.14**	-.07	-.15**	-.23**
Number of different individual sports								
6. Age 6	0.69 (1.07)	-.05	-.08	-.03	-.07	-.05	-.05	-.20
7. Age 7	0.83 (1.14)	-.04	-.03	.01	-.03	-.04	.00	.01
8. Age 8	0.86 (1.19)	-.08	-.02	.00	-.06	-.05	.00	.05
9. Age 9	0.78 (1.16)	-.01	.00	.02	.02	-.07	-.01	.08
10. Age 10	0.81 (1.20)	-.06	-.03	-.02	-.05	-.08	-.01	.08
Depression								
11. Age 6	2.05 (0.85)		.23**	.62**	.15**	.56**	.18**	-.06
12. Age 10	2.01 (0.96)			.13**	.59**	.09*	.61**	-.14**
Anxiety								
13. Age 6	1.83 (0.73)				.13**	.33**	.11**	-.01
14. Age 10	1.75 (0.73)					-.03	.33**	-.04
Social withdrawal								
15. Age 6	2.51 (0.84)						.16**	-.23
16. Age 10	2.30 (0.78)							-.12**
Covariate								
17. Gender [a]								

[a] (0 = boys, 1 = girls; 62% boys).

** $p < 0.01$ (two-tailed), * $p < 0.05$ (two-tailed)

Table 3

Fit Indices for the One-, Two and Three-Trajectory Models for Team and Individual Sports

Number of classes	AIC	BIC	Entropy	VLMR (p)	Lowest AvePP
Team sports					
1 (L)	6739.32	6757.98	-	-	-
2 (L L)	**5946.82**	**5979.48**	**0.76**	**0.00**	**0.93**
3 (L L L)	5847.43	5894.08	0.65	0.00	0.77
Individual sports					
1 (L)	7397.61	7416.27	-	-	-
2 (L L)	6621.39	6654.05	0.77	0.00	0.92
2 (I L)	**6618.43**	**6646.43**	**0.77**	**0.00**	**0.93**
3 (L L L)	6543.84	6590.50	0.63	0.00	0.75

Note. Bold characters indicate the best fit. Letters between parentheses indicate whether the model was fitted with the intercept only (I), the linear (L), the quadratic (Q) or the cubic (C) growth factor. AIC = Akaike information criterion; BIC = Bayesian information criterion; VLMR = Vuong-Lo-Mendell-Rubin Likelihood Ratio Test; AvePP = Average Posterior Probabilities.

Table 4

Results of Regression Models Testing Predictive Associations between Team, Individual and Joint Trajectories (*n* = 785)

	b	β	SE	*p*	95% CI (β)
Depression at age 10					
Team sports trajectories	-.25	-.12**	.04	.001	-.20, -.03
Individual sports trajectories	-.10	-.05	.04	.243	-.13, .03
Gender	.29	.15***	.04	.000	.06, .23
Depression at age 6	.15	.14***	.04	.000	.07, .20
Versus Team sports only					
Low participation in both sports	.30	.16**	.06	.005	.05, .27
High participation in both sports	-.03	-.01	.04	.845	-.09, .07
Individual sports only	.13	.05	.05	.336	-.05, .16
Versus Low participation in both sports					
High participation in both sports	-.32	-.10*	.04	.017	-.18, -.02
Individual sports only	-.17	-.07	.05	.127	-.16, .02
Versus High participation in both sports					
Individual sports only	.15	.06	.07	.323	-.06, .19
Anxiety at age 10					
Team sports trajectories	-.15	-.09*	.04	.027	-.18, -.01
Individual sports trajectories	-.05	-.03	.04	.484	-.11, .05
Gender	.08	.06	.05	.215	-.03, .14
Anxiety at age 6	.12	.12**	.04	.001	.05, .19
Versus Team sports only					
Low participation in both sports	.26	.18**	.06	.001	.07, .29
High participation in both sports	.17	.07	.05	.155	-.03, .16
Individual sports only	.10	.05	.05	.303	-.05, .15
Versus Low participation in both sports					
High participation in both sports	-.09	-.04	.04	.396	-.12, .05
Individual sports only	-.16	-.09*	.04	.044	-.17, .00
Versus High participation in both sports					
Individual sports only	-.07	-.04	.07	.562	-.17, .09

Table 4 (continued)

	b	β	SE	*p*	95% CI (β)
Social withdrawal at age 10					
Team sports trajectories	-.28	-.16***	.04	.000	-.24, -.08
Individual sports trajectories	-.06	-.03	.04	.406	-.11, .05
Gender	.23	.14***	.04	.001	.06, .23
Social withdrawal at age 6	.12	.13**	.04	.001	.05, .20
Versus Team sports only					
Low participation in both sports	.34	.22***	.06	.000	.11, .33
High participation in both sports	.07	.03	.04	.530	-.05, .11
Individual sports only	.25	.13*	.05	.014	.03, .23
Versus Low participation in both sports					
High participation in both sports	-.27	-.10*	.04	.010	-.18, -.02
Individual sports only	-.09	-.05	.04	.290	-.13, .04
Versus High participation in both sports					
Individual sports only	.18	.09	.06	.122	-.02, .21

˜ *p* < .07, * *p* < .05, ** *p* < .01, *** *p* < .001

Note. Team and individual sports trajectories are coded as 0 = low participation, 1 = high participaton; gender is

coded as 0 = girls, 1 = boys. Covariates are gender and the baseline level of internalizing problems at age 6.

Figure 1

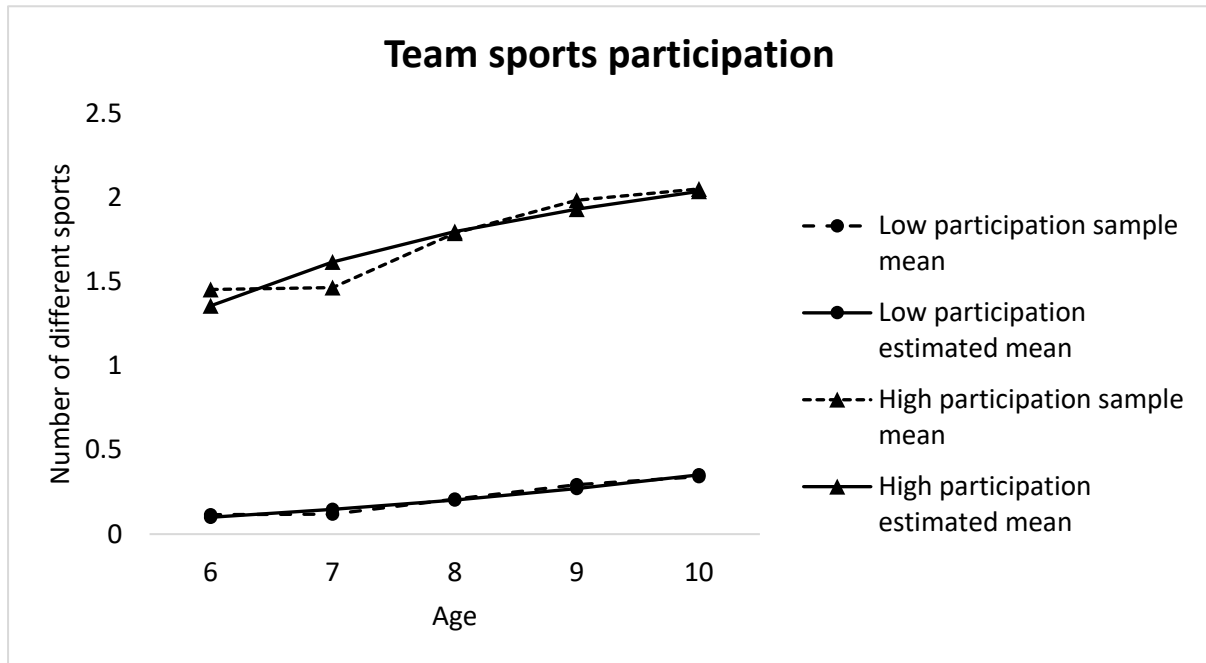*Estimated Means and Observed Values of Team Sports Latent Trajectory Groups*

Figure 2

Estimated Means and Observed Values of Individual Sports Latent Trajectory Groups